IoT-Based Plant Monitoring System

Introduction

- This project deals with the plant’s monitoring mechanism which gives information about the temperature and humidity.
- This can be done by using various sensors, here we used the temperature sensor DHT22.
- This Project will help in enhancing the growth of plants.

Components

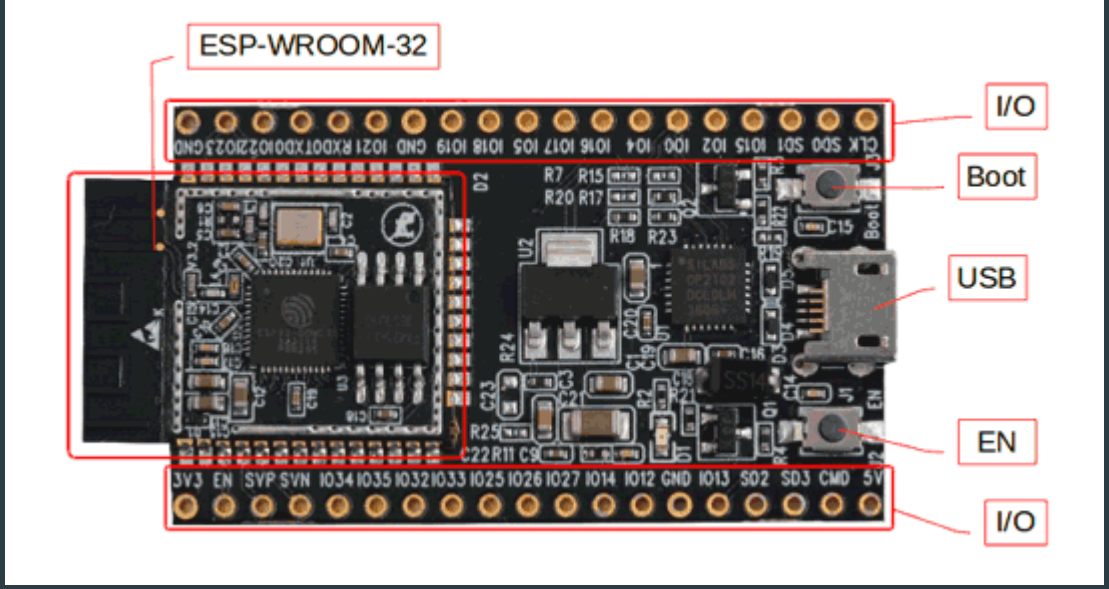
- Board ESP32.
- Temperature sensor DHT22.
- Bread Board.
- Resister.
- Wires.

ESP32 BOARD

Let’s take a look at the ESP32 module. It is breadboard friendly since most of the pin headers are broken out as I/O pins facing each other which is a great thing. Let’s break the board into small parts to know the purpose of each segment.

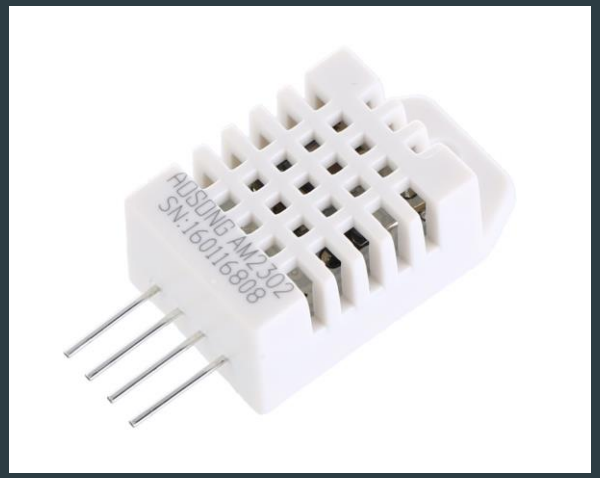
- **Micro-USB jack:** The micro USB jack is used to connect the ESP32 to our computer through a USB cable. It is used to program the ESP module as well as can be used for serial debugging as it supports serial communication.
- **EN Button:** The EN button is the reset button of the ESP module. Pressing this button will reset the code running on the ESP module.
- **Boot Button:** This button is used to upload the Program from Arduino to the ESP module. It has to be pressed after clicking on the upload icon on the Arduino IDE. When the Boot button is pressed along with the EN button, ESP enters into firmware uploading mode.
- **Red LED:** The Red LED on the board is used to indicate the power supply. It glows red when the board is powered.

- **Blue LED:** The Blue LED on the board is connected to the GPIO pin. It can be turned on or off through programming. This lead might also be in red color.
- **I/O pins:** This is where major development has taken place. We can access all the I/O pins of the module through the break-out pins. These pins are capable of Digital Read/Write, Analog Read/Write, PWM, IIC, SPI, DAC, and much more.
- **ESP-WROOM-32:** This is the heart of the ESP32 module. It is a 32-bit microprocessor developed by Express if Systems.



DHT22 SENSOR

- 3 to 5V power and I/O
- 2.5mA max current use during conversion (while requesting data)
- Good for 0-100% humidity readings with 2-5% accuracy
- Good for -40 to 80°C temperature readings ±0.5°C accuracy
- No more than 0.5 Hz sampling rate (once every 2 seconds)
- Body size 27mm x 59mm x 13.5mm (1.05" x 2.32" x 0.53")
- 4 pins, 0.1" spacing
- Weight (just the DHT22): 2.4g

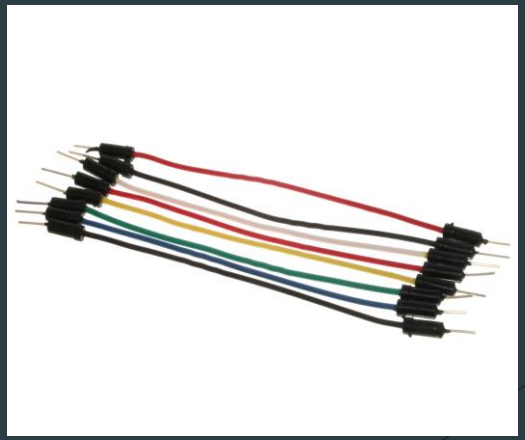


ARDUINO IDE

- As we know we need a text/code editor to write the code, a compiler to convert that code to machine code or binary files so that the microcontroller can understand, and also programming software to load these firmware files onto the microcontroller. When we combine all these with some additional features like debugging support, console support, etc., that's what we call an IDE (Integrated Development Environment) or in simple terms the Arduino Software. Arduino IDE, as the name states, is a development IDE for the Arduino boards. It consists of a feature-rich code editor, compiler, programmer, serial console, serial plotter, and many other features. It is simple and easy to use. Arduino IDE is cross-platform, and it can run on operating systems from Microsoft, Linux, and Windows.

JUMP WIRE

- A jump wire is an electrical wire, or group of them in a cable, with a connector or pins at each end, which is normally used to interconnect the components of a breadboard or other prototype or test circuit, internally or with other equipment or components, without soldering.

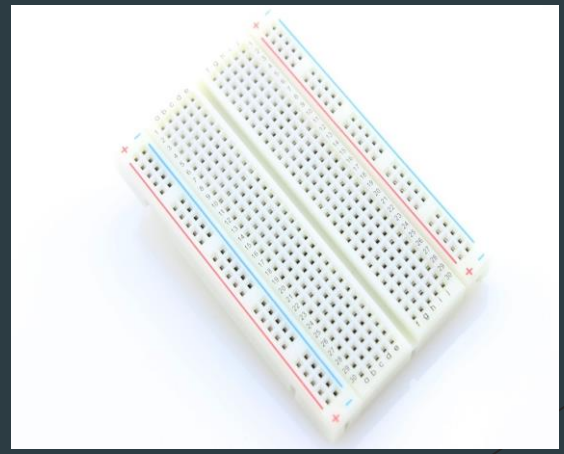


RESISTOR

- Commonly used in breadboards and perf boards, these 10K resistors make excellent pull-ups, pull-downs, and current limiters. To determine the value of a given resistor look for the gold or silver tolerance band and rotate the resistor as in the photo on the left.

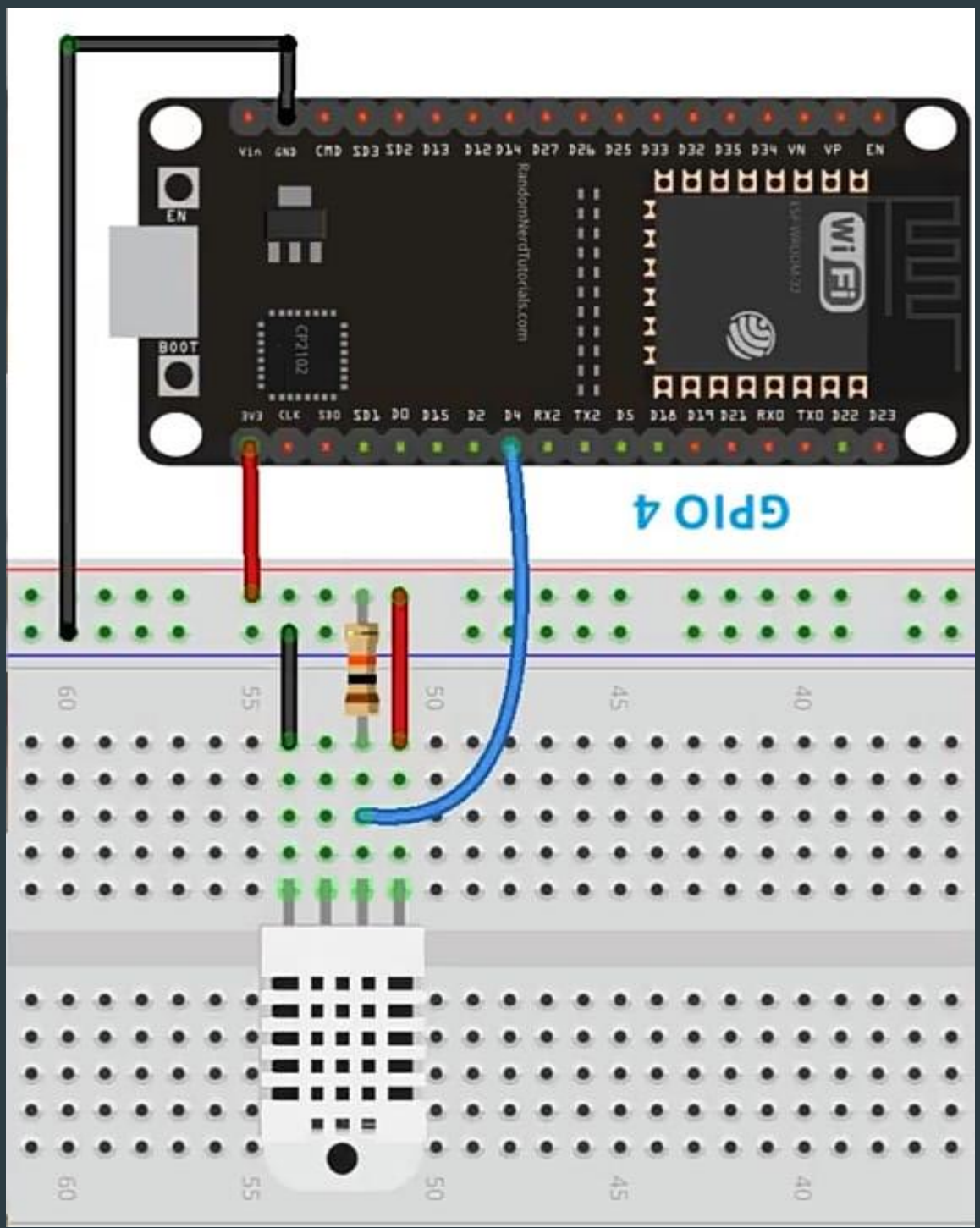
BREADBOARD

- A breadboard is a simple device designed to let you create circuits without the need for soldering (**a process used for joining metal parts to form a mechanical or electrical bond**). They come in various sizes, and the design can vary, but as a general rule they look something like this.



ASSEMBLING HARDWRARE

- Using the breadboard we connect the temperature sensor to the first 4 squares of the breadboard.
- Connect the first wire, male to male connector, with the first pin of DHT22 that always be 3.3V. The first pin connects in the first row and the other end connects with the positive rail.
- Second wire will be male to the female wire. The male end connects with the right next row to the first wire. The female end will connect to the D4 pin at ESP32.
- Connect resistor below the 2nd wire and its second end connect with the other side of the trench.
- 3rd pin will remain unused.
- Takin 4th male to the male wire, connect to 4th row and the other end connects to the negative rail.
- Again taking the 5th wire to the female wire, connect it to very next to the first wire at the positive rail that wire connects with the 3.3V I/O pin of ESP32.
- 6th male to female wire connects next to the 4th wire at the negative rail that connects with the ground (GND) of ESP32.
- The last wire connects below the leg of the resistor and this wire connects to the 3.3V rail of the breadboard. The resistor is now connected.


Vin GND CMD SD3 SD2 D13 D12 D14 D27 D26 D25 D33 D32 D35 D34 VN VP EN
EN
BOOT
CP2102
RandomNerdTutorials.com
3V3 CLK SD0 SD1 D0 D15 D2 D4 RX2 TX2 D5 D18 D19 D21 RXD TXD D22 D23
GPIO 4
60 55 50 45 40
60 55 50 45 40

ThingSpeak

- ThingSpeak is Open Source software written in Ruby which allows users to communicate with internet-enabled devices.
- ThingSpeak helps users to analyze and visualize uploaded data using Graphs and we can easily export data in CSV format.
- ThingSpeak is also helping us to live the data through thingspeak we can add up to 3 users to share data for a channel so users can see the data of your project.
- After exporting the data from thingspeak we can also Analyst the data to get the best result from it.

CONCLUSION

As a result, the "IoT Smart Plant Monitoring System" has been successfully planned and constructed. It was created by combining the features of all of the hardware components used. Every module's presence has been carefully considered and positioned, resulting in the best possible operation of the unit. The system was thoroughly tested to ensure that it will run on its own. The temperature sensor monitors the temperature and humidity of the environment. If temperature levels are changed, it alerts the user through the app. Users have the ability to monitor and control the units from anywhere in the world at any time. As the special function of the IoT device, the device can check the plant’s healthiness by checking the color of the plant’s leaves, the plant’s surrounding temperature, and the humidity. Also, we used several pre-determined datasets to check whether the plant is healthy or not with the help of the above factors.